Scattering Theory. By John R. Taylor. John Wiley and Sons, Inc., New York (1972). 477 pp. $14.95.

In the Preface to *Scattering Theory*, the author, John R. Taylor, states, "This book is intended for any student of physics who wants a thorough grounding in the theory of nonrelativistic scattering. It is designed for a reader who is already familiar with . . . quantum mechanics (as . . . the first year graduate course) . . . . The book is . . . less useful as a reference for the active researcher."

In my opinion, the author has served his purpose admirably well. The book is extremely clearly written and should be easily understood by any graduate student of either physics or engineering, so long as the requisite quantum course has been studied. Taylor's approach is also sound pedagogically, in that he first (in Chaps. 1 through 15) develops all the formulas for single-channel (i.e., elastic) scattering. In Chaps. 16 through 22, he extends the formalism to the multichannel case, but by then the basic principles should be well understood by the reader and the general case is more or less a matter of computational detail.

The author takes the "modern" approach, which is to develop scattering theory initially in the "time dependent" formalism, by using the Møller wave operators which convert the asymptotic "in" and "out" states to the actual orbits of the system. The S matrix is then introduced, as are the on- and off-shell T matrices, in terms of which expressions for the cross section is derived. The connection between scattering by a fixed potential and two-body scattering is explained, and the relationship between the momentum (or "experimental" basis) and the angular momentum (or "partial wave") basis is derived. Scattering between particles with spin is treated, and the author even derives the helicity representation that is so important in relativistic problems.

The next step is to express stationary-state scattering theory, through Green's function techniques, the Born approximation, and the Lippman-Schwinger equation, and derive its connection with the time-dependent formalism. Then a number of very special topics are considered, including partial wave amplitudes and Jost functions,[a] and analytic properties when the energy or momentum are allowed to take on complex values. Bound states and resonances are described in terms of poles of the S matrix (or, if you prefer, zeroes of the Jost function) and dispersion relations introduced, including the Mandelstam double-dispersion representation, with subtractions. Even Regge poles make the grade, and the author attempts to clarify to the reader how these concepts have been applied in particle physics.

[a]Jost functions have recently been introduced into transport theory by K. M. Case (to be published); that is another reason why nuclear engineers might study this book.

From this summary, one can see that most of the basic ideas important in modern physics are included in the book, in a particularly simple context, i.e., nonrelativistic scattering theory. To the reader who wants to understand what the particle physicists are really doing, this book should be invaluable. For the nuclear engineer who wants to understand the bases of the calculations and measurements that provide his cross-section data, the book should be equally invaluable. For the technically inclined reader, who feels like spending several pleasant evenings studying a clear exposition of what's up in modern physics, the book should be a pleasure!

To end with one slightly critical note, I do feel that perhaps a single chapter, at least sketching out how the various concepts are applied to the relativistic case, would have been valuable. However, there are ample references, and the interested reader can and should consult them.

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November 12, 1973

About the Reviewer: Paul Zweifel is experiencing a long and varied career in nuclear science and technology. His present association as University professor of physics and nuclear engineering at the Virginia Polytechnic Institute and State University and his pedagogical experience at the University of Michigan and at Middle East Technical University qualify him highly as the reviewer of this text on scattering. Dr. Zweifel did his academic studies at Carnegie Institute of Technology and Duke University.

The Invariant Imbedding Theory of Nuclear Transport. By J. O. Mingle. American Elsevier Publishing Company, Inc., New York (1973). 131 pp. $11.50.

If the reactor physicist or shield designer has wanted to know the impact invariant imbedding could have on his work, the situation has been either feast or famine. Until recently, there was no text devoted to this area. Now within the last year, two books on the subject, both rather short monographs, have been published. The first of these, *Application of Invariant Imbedding to Reactor Physics*, by A. Shimizu and K. Aoki, appeared in 1972 and was reviewed in this journal (May 1973). The book we shall discuss here is *The Invariant Imbedding Theory of Nuclear Transport*, written by John Mingle, currently the director of the Institute for Computational Research in Engineering and a professor of nuclear engineering at Kansas State University.